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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/597,161

06/20/2000

Ichiro Okabe

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5143

22428

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12/15/2004

FOLEY AND LARDNER

SUITE 500

3000 K STREET NW

WASHINGTON, DC 20007

EXAMINER

DIAZ, JOSE R

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 12/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/597,161	Applicant(s) OKABE ET AL.	
	Examiner José R. Díaz	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 September 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3,5,6,8 and 9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,5,6,8 and 9 is/are rejected.
- 7) ☒ Claim(s) 3 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1, 5-6 and 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tang et al. (US Pat. No. 6,156,485) in view of Cheung et al. (EP 0 840 361 A2).

Regarding claims 1, 5, 8 and 9, Tang et al. teaches a method of forming a fine pattern, comprising the steps of:

forming a silicon-oxide-based film (140) on an underlying layer (120), wherein the silicon-oxide-based film is formed by using SiH₄ and N₂O as material gases at a reaction temperature of over 450 °C (See figure 3A and col. 6, lines 20-28);

forming a chemically-amplified photoresist (150) (see figure 3A);

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transferring a mask pattern onto the chemically-amplified photoresist layer (150) upon exposure through a mask (consider the patterned photoresist layer shown in figure 3A and described in col. 2, ll. 8-18 and col. 6, ll. 29-32).; and

etching the underlying layer by way of a resist pattern (150), to thereby form a fine pattern in the underlying layer (120) (see figure 3D).

However, Tang et al. fails to teach the limitation of controlling the amount of nitrogen in the silicon-oxide-based film to about a value of 0.01-0.08 atm%. Cheung et al. teaches that it is well known in the art to reduce the nitrogen content in the silicon-oxide-based film such that little or none of the nitrogen is incorporated into the silicon-oxide-based film (col. 5, lines 13-17, col. 15, lines 36-37; col. 16, lines 14-16; col. 19, lines 48-50; and col. 20, lines 17-23).

Tang et al. and Cheung et al. are analogous art because they are from the same field of endeavor as applicant's invention. At the time of the invention it would have been obvious to a person of ordinary skill in the art to reduce the nitrogen content in the silicon-oxide-based film to about a value of 0.01-0.08 atm%. The motivation for doing so, as is taught by Cheung et al., is to produce a fine pattern by reducing footing experienced in a subsequently applied photoresist (col. 5, lines 6-10). Therefore, it would have been obvious to combine Cheung et al. with Tang et al. to obtain the invention of claims 1, 5-6 and 8-9.

Regarding claim 6, Tang et al. teaches forming the silicon-oxide-based by means of a PECVD (see col. 6, ll. 20-21).

Allowable Subject Matter

4. Claim 3 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art fails to teach, disclose, or suggest, either alone or in combination, a further step of exposing the silicon oxide based film to a plasma atmosphere of O₂ or N₂O.

Response to Arguments

5. Applicant's arguments with respect to claims 1, 5-6 and 8-9 have been considered but are moot in view of the new ground of rejection.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ku et al. (US Pat. No. 6,171,764 B1) teaches the formation of a Si_xO_yN_z by PECVD using SiH₄ and N₂O as the reactant and a temperature of about 350-550 °C, wherein the quantity of the material composition (x,y,z) is modified by adjusting the flow rate of the reacting gases and process time (see col. 3, lines 15-37 and col. 4, lines 35-50); and Hagayama (US Pat. 5,674,356) discloses a method for forming a fine pattern by utilizing an anti-reflective layer which is excellent in etching characteristics (see abstract).


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Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to José R. Díaz whose telephone number is (571) 272-1727. The examiner can normally be reached on Monday through Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

 12/13/07
José R. Díaz
Examiner
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